

Committee members should bring the large packet of attachments from the March 19 worksession.

MEMORANDUM

TO: Transportation and Environment Committee

FROM: MF Michael Faden, Senior Legislative Attorney
GO Glenn Orlin, Deputy Council Staff Director

SUBJECT: **Worksession #6:**
Bill 48-06, Streets and Roads – Comprehensive Revisions
Subdivision Regulation Amendment 06-04, Streets and Roads – Design Standards

1. Numeric standards. During this worksession the Committee will address the numeric standards in the bill. First of all, however, it is important to make clear their *meaning*, because it has evolved significantly since when the bill was introduced in December:

December	Now
The numeric standards are permanently in law. They would be part and parcel of a new series of detailed street cross-sections and other design elements in Method 2 Executive regulations.	The numeric standards are in an uncodified part of the law. They serve as the <i>guide</i> for Method 2 Executive regulations. Once the regulations are approved, the standards 'disappear' from the law.
The Executive has 4 months to transmit Method 2 regulations.	The Executive has 12 months to transmit Method 2 regulations. The Council can extend this deadline by resolution.
The numeric standards in the law go into effect upon enactment of the bill.	The numeric standards in the law go into effect only if the Executive does not transmit regulations within 12 months (longer, if extended by a Council resolution) or if the Council does not approve the regulations within 3 months of their receipt.
Deviations from the standards may occur only if they are approved by the Planning Board (for improvements that are conditions of development approval) or by the Council (for County-funded projects).	Spot deviations from the standards can be approved by the Executive Branch. A general deviation from a standard, however, must be approved by either the Planning Board or the Council.

Therefore, whatever numeric standards are ultimately included in the bill would go into effect only if the Method 2 regulations are not transmitted on time, or if the Council does not approve them within 3 months after that. In other words, *they would be standards only in default*. It is important that such default standards exist in law, however, to guard against this work dragging out interminably, thus missing opportunities to design better streets.

Secondly, it is important to recall where and when the new design standards would be applied:

- *The standards would apply directly only to County roads, not State, municipal, or private roads.* The State or municipal governments may choose to emulate these standards, but that would be their choice.
- *The standards would apply directly only to new County roads and subdivision streets, and roads that are reconstructed.* The County could use the tighter standards as the predicate to re-stripe existing roads to create narrower lanes and new bike lanes, and this would be in sync with the spirit of the bill. (More on this later.) But the bill does not mandate this.
- *The standards apply to physical features of County roads, not their operation.* Easing parking restrictions, lengthening pedestrian crossing times at traffic signals, and other operational actions would be in sync with the bill's objectives. But, again, the bill does not mandate this.

Finally, Council staff notes that there has been too much hyperbole about the bill: claims that it would dramatically improve pedestrian safety and dramatically lengthen drivers' commute; that it would eliminate speeding on residential streets and make them impassable for fire trucks, buses, and trash trucks; and—depending who one talks to—that it would make bicycling safe or make bicycling dangerous. Certainly, if the standards were tightened too much, such hyperbole would be warranted. But the proposed changes, especially in this latest version, are modest ones. Council staff believes it was well put by the Committee's April 10 panelists, who said that streets must be designed for all its users, but that current standards are weighted *somewhat* too much towards the convenience of drivers and thus to the detriment of the safety of all users, including drivers.

Based on the comments received in testimony, correspondence, and further conversations with staffs and interested citizens, Council staff recommends several changes to ©44-47, which contains the numeric values for design standards. Several stakeholders active in the deliberations about these bills recommend that specific standards be included in the bill (©223). **Council staff's revised recommended table of design standards and the associated notes are on ©200-202.**

a. Target speed. As the Planning Board recommended, Council staff recommends that each road classification, by area, have a unique 'target speed.' Target speed is defined by the Institute of Transportation Engineers (ITE) as:

the speed at which vehicles should operate on a thoroughfare in a specific context, consistent with the level of multimodal activity generated by adjacent land uses to provide both mobility for motor vehicles and a safe environment for pedestrians and bicyclists. The target speed is usually the posted speed limit. (ITE, *Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities*, 2006, p. 90.)

The target speed should reflect the speed at which most drivers will feel comfortable driving, given all aspects the roadway's design: horizontal and vertical curvature, sight distance, lane width, horizontal obstructions (e.g., curbs, placement of street trees), and similar elements.

Council staff recommends setting a target speed of 25 mph for every street in an 'urban' area, and 15 mph for alleys. These are speeds that are compatible with the moderate-to-heavy pedestrian activity that exists or is ultimately anticipated in the county's 'urban' areas. Secondary and tertiary residential streets would have target speeds of 20 mph (which is also the speed that a car can comfortably pass over a regular speed hump) and Primary Residential Streets would have a target speed of 25 mph. Higher classifications would have progressively higher target speeds. Within the same classification, the target speed in the 'rural' areas often would be higher than in the 'suburban' area. In 'rural' and 'suburban' commercial areas, the target speed would be 30 mph (see ©202, note (7)).

b. Lane width. Responding to the Planning Board's recommendation, **Council staff recommends reducing the lane-widths of non-residential streets in 'urban' areas by a further 0.5'.** The lane-widths would generally be 10'; the exceptions would be Major Highways and Parkways, which would have lane widths of 10.5'. Examples of existing Major Highways with lanes about 10' or less in width are:

Wisconsin Avenue: Friendship Heights to Bradley Boulevard
Wisconsin Avenue: East-West Highway to Battery Place
Colesville Road: Georgia Avenue to Dale Drive
Connecticut Avenue: Chevy Chase Circle to East-West Highway

Many other major highways have lane-widths of about 10.5'. The predominant lane widths for Major Highways and Arterials are 11' or 12'. The bill's proposed lane widths would generally result in no more than 1' per lane difference (if any) with roads outside 'urban' areas.

Several bicycle advocates objected to providing only 1' more for a shared-use roadway, formerly known as a Class III Bikeway, where motor vehicles and bicycles generally travel next to each other. They proposed that the curb lane be widened to 14' where a shared-use roadway is designated. The Coalition for Smarter Growth recommends 13'-wide shared parking/bicycle lanes in 'urban' areas (©226). **Council staff recommends that, in 'suburban' and 'rural' areas, 2' be added to the curb lane where a shared-use roadway is consistent with the master plan, as per note (1).** This means that where the design standards otherwise call for 12' lanes, the curb lane would be 14' wide (plus 1' for the gutter), where the standards call for 11' lanes, the curb lane would be 13' wide, etc. In 'urban' areas, however, taken as a whole the road design elements will produce a slow enough speed so that bikers be able to ride safely in front and behind motor vehicles and not need to ride outside them.

Another concern of the bicycle advocates was the bill's proposed widths for paved shoulders on open-section roadways, as bikers often use the shoulders where speeds are high and there is no designated bike lane. The bill proposed 4' paved shoulders for Major Highways and 2' paved shoulders for other classifications to reduce potential imperviousness and discourage

excessive motor vehicle speed. **Council staff recommends, for open-section roadways, 5' paved shoulders for Controlled Major Highways and Major Highways and 4' paved shoulders for Country Arterials, Arterials, and Minor Arterials.** Stormwater from wider paved cross-sections can be managed with sufficient bio-retention measures. Other techniques can mitigate potential speeding, such as adding a tactile differentiation in the lane marking that separates the outside lane from the shoulder.

c. Curbside width. **Council staff agrees with the Planning Board that 'curbside width' should be added to the table.** Curbside width is the area beyond each curb that is necessary for sidewalks, shared use paths, street trees and other landscaping, streetlights, utilities, and other elements. Planning staff proposed that this area generally extend 15' beyond the edge of the curb to accommodate these elements. For open-section roads and streets, this area is more variable because of the need to provide swales, so in those cases the standards should be finalized in the design standards set by Executive regulation.

d. Bike lane width. The bill requires master-planned bike lanes to be 5' wide on Controlled Major Highways, Major Highways, Country Arterials, and Arterials, 4' wide on Minor Arterials, and 3' wide on Primary Residential Streets. **Council staff recommends that master-planned bike lanes on Arterials in 'urban' and 'suburban' areas be 4' wide, and be 5' wide in 'rural' areas only.** The 4' width is a better fit with the target speed and traffic volume on Arterials. **Country Arterials should have a bike lane width of 4' to reflect the purpose of this classification, which is to preserve as much of the rural ambience as possible.**

The Coalition for Smarter Growth recommends using the ITE standards for bike lane widths (©226). For a street with no parking ITE cites a 'minimum' width of 5' (including the 1' gutter pan) for closed section streets and 4' where there is no curb and gutter. For a street with parking ITE cites a 'minimum' 12' width for a shared bike/parking lane (©228). The County's Countywide Bikeway Functional Master Plan also acknowledges a minimum bikeway width of 4' (©229). The standards in the table and notes meet or exceed ITE's 'minimum' standard already, but a clarification in note (2) on ©202 would be helpful. **Council staff recommends that the last sentence in note (2) be clarified to read: "This bike lane width replaces the added shared use roadway width under note (1)" (emphasis ours).**

The Coalition for Smarter Growth objects to the 3'-wide bike lane standard for Primary Residential Streets. They also note that "most low speed/low volume traffic environments do not require specific space in addition to the vehicle travel lane for safe and comfortable driving" (©226). Council staff believes that current Primary Residential Streets with higher traffic volumes will be re-classified as Minor Arterials, which have a bike lane standard width of 4'. For lower volume Primaries and for Principal Secondaries, 3' of width is sufficient; a better solution for these roads is for the master plan to eliminate bike lanes from them.

e. Sidewalk width. Planning staff pointed out that sidewalks in 'urban' areas are very wide, and the 5+' notation does not provide much guidance. Therefore, **Council staff recommends that sidewalks in 'urban' areas be at least 15' wide on Major Highways and at**

least 10' wide on Arterials. Staff also recommends that all streets with a Primary Residential Street or higher classification have 5'-wide sidewalks.

However, Council staff continues to recommend that Secondary and Tertiary Residential Streets have 4'-wide sidewalks. This is wide enough to comfortably accommodate the relatively small number of pedestrians who walk along these streets. In the rare case where two baby carriages or wheelchairs pass each other one can yield to the other, which is exactly the behavior expected of drivers on Secondary and Tertiary Residential Streets.

f. Curb return (corner) radius. The bill requires a maximum 15'-wide curb return radius for intersections in 'urban' areas, with appropriate adjustments to allow fire and rescue vehicles to negotiate such a tight corner. The bill calls for a maximum 25' radius elsewhere.

Council staff recommends deleting specific curb return standards from the bill. We still believe the size of the curb return radius is extraordinarily important in determining pedestrian safety at an intersection, and it is imperative that this standard be explicitly reduced in the Executive regulation. However, several interlocking factors contribute to the determination of the proper curb return radius (see ©203-212) and it would be simplistic to reduce the legal requirements to only two standards. **However, Council staff recommends expressly requiring that curb return radii be as small as feasible in a given context.** If the Council wants a numeric standard to be included in the bill, the Coalition for Smarter Growth's suggestion of designing curb returns for a target speed no to exceed 10 mph is a good one (©227).

g. Trees in medians and landscape panels. For any road where the design speed is 40 mph or less, the bill would allow trees 4" in diameter at maturity to be planted in medians at least 8' wide and trees greater than 4" in diameter at maturity to be planted in medians at least 12' wide. Planning staff advised that an 8'-wide median is wide enough for a street tree of any caliper. They would require that the median trees be "tall growing shade trees with spacing that will ensure good sight distances." The Planning staff's position is described on ©216.

The bill attempted to allow some trees to be placed in narrow medians, but Planning staff raises good points about the disadvantages of low-canopy trees in the median. **Council staff recommends a compromise: accept the Planning staff's language, but require that the median be at least 10' wide rather than 8', as recommended by ITE (©217).**

The bill also requires that a landscape panel abutting a curb must be at least 5' wide and 8' long, and trees planted in these panels must be "at least 30 feet apart unless the tree spacing is interrupted by a public street or driveway". This is a drafting error: the phrase should say that the trees should be planted "*no more than 30 feet apart*" Planning staff recommended that the spacing should be closer: 25' feet. **Council staff recommends keeping 30' as the maximum spacing.** Certain trees have broad enough canopies and can be spaced as much as 30' apart. The 30' standard allows for more flexibility in type of trees to be planted along the curbside, especially where other curbside elements, such as parking meters, are required.

h. Stormwater management standards. The Stormwater Partners proposed a 'Green Streets Amendment' to the Road Code, defining the minimum amount of stormwater in a 24-hour period to be retained and treated on site within the right-of-way, preferably using vegetation-based stormwater management techniques. The Partners would apply standards of ½" in 'ultra-urban' areas, 1" in 'urban' areas, 2" in 'suburban' areas, and 3" in 'rural' areas. The purpose and technical proposal of the Green Streets Amendment is on ©218-222.

Council staff recommends that the law include standards such as these, except that a range of ½"-1" range should be used for 'urban' areas: ½" for the older downcounty urban areas and 1" for newer urban areas. The Committee should review the implication of these proposed standards with the Department of Environmental Protection and the Stormwater Partners before determining the precise standards.

2. Boundary issues. In an earlier worksession the Committee discussed but did not fully resolve what set of standards should be applied to a road that runs along a boundary between an 'urban' and 'suburban' area. **Council staff recommends that where a road is the boundary between the 'urban' and 'suburban' area, the 'urban' standards should apply to the entire right-of-way of the road.** An example is Shady Grove Road between MD 355 and I-370. On the south side is the Shady Grove MSPA, an 'urban' area. On the north side, part of the 'suburban' area, are properties (such as Casey 7 and The Grove Shopping Center) slated for development or redevelopment in the Shady Grove Sector Plan. Under our recommendation, all of Shady Grove Road between MD 355 and I-370 would be covered by the 'urban' standards. In the earlier worksession the Committee did agree that where a road is the boundary between the 'suburban' and 'rural' area, the 'suburban' standards should apply.

There also needs to be an area where a road transitions from one set of standards to another. **Council staff recommends that the transition area between 'urban' and 'suburban' areas should be entirely in the 'suburban' area.** For example if Nicholson Lane were reconstructed near the White Flint MSPA, its lanes might be 10' wide inside the MSPA and 11' wide outside it. The transition from 11' to 10' lanes should start beyond the boundary and be complete where the road reaches the boundary. **Similarly, the transition between 'suburban' and 'rural' areas should be entirely in the 'rural' area.**

3. Road classifications in 'urban' areas. The Planning staff recommended reclassifying each Major Highway as it passes through an 'urban' area to be in a new 'Major Business District Street' classification. Its purpose is to recognize "that roadways need to change function and character as they enter into and pass urban areas." An example given is that off-peak parking on a designated Major Highway is not permitted except through waivers. The Planning staff's position is fully described in their memo on ©215. The Coalition for Smarter Growth concurs (©225-226). The Garrett Park Estates-White Flint Park Citizens' Association opposes this idea. GPE-WFPCA also opposes applying the 'urban' designation to the Grosvenor Metro Station Policy Area (©230).

Council staff recommends retaining the bill's road classifications. A Major Highway does not change its overall *function* where it passes through in urban area: it still needs to

provide primarily for through movement. If Major Highways can't provide this function, what type of road would do so? The decision to allow or not allow on-street parking on a designated Major Highway is an operational decision, which is not the province of the road construction code. Operational decisions are best left to the State Highway Administration and the County Department of Public Works and Transportation.

However, Council staff agrees that a Major Highway does need to change its *character* as it passes through urban areas, which is why the proposed 'urban' Major Highway standards require a low target speed, narrower lane-widths, no widened curb lane, a wide curbside width, and tighter curb return radii.

4. Resurfacing. The bill's authors did not conceive of normal resurfacing as 'reconstruction,' thus it would not be a trigger for changing the roadway's dimensions. The Coalition for Smarter Growth recommends a middle ground. It requests the bill include following language:

The revised standards shall apply to resurfacing projects where re-striping with the new travel lane and bicycle lane dimensions or other changes requires no or minimal additional traffic analysis. If the roadway is resurfaced and the old standard dimensions facilities are put back in place, a written explanation shall be provided to the Planning Board and County Council justifying the action to maintain the old standards. (©226)

The Planning Board has suggested an approach like this as well.

Council staff concurs with this approach, and recommends including the text in the bill (with some editing for legal form and sufficiency). The approach makes clear that when a road is resurfaced the opportunity to re-stripe the lanes to the new standards should be taken whenever feasible; at the same time, resurfacing would not trigger the more extensive and expensive improvements of a complete 'reconstruction.'

5. Sidewalk waiver. The current law allows the Director of Permitting Services to waive the requirement to build sidewalks if the lots abutting the right-of-way are unimproved or the terrain is such that a sidewalk can be built only at an "excessive" cost or is otherwise undesirable (©71). The Director may even deny this waiver, however, if the sidewalk would be located along a Primary Residential Street or higher classified road or is "necessary or desirable to provide safe access for pedestrians" (©71-72).

Periodically a subdivision is built along a section of road where the required sidewalk would connect to nothing else, not to a school, a bus stop, or even another sidewalk which is not uncommon for subdivisions in semi-rural and rural areas. The result can be a rather useless 'improvement' that the County must maintain and fronting residents must clear snow from. In such cases, the bill allows the Director of Permitting Services to waive the requirement in exchange for the builder: (1) dedicating the necessary right-of-way and easements to allow the sidewalk to be built in the future; and (2) paying a fee equal to the design, construction, and construction management costs of the sidewalk. The proceeds from these fees would be assigned to a capital account for new sidewalk construction, and spent when the Council

appropriates the funds (presumably in addition to the G.O. Bond-funded expenditures in the Capital Improvements Program's *Annual Sidewalk Program* or some other individual sidewalk project in the CIP).

The Executive's comments are:

Allowing a developer to pay a fee in lieu of constructing sidewalk should only be done as a last resort, and only after considerable proof of hardship to be approved by the County Executive or designee. This philosophy is in keeping with the County's goals of creating walkable communities and ensuring pedestrian safety. The cost basis for the fee should reflect the timing of the future construction. (©153)

Council staff agrees that this provision would be used infrequently, but to the extent that it is used it would provide more funds for sidewalks needed in the short term. **However, Council staff does not agree that the cost basis for the fee should reflect the timing of future construction.** If the funds would essentially be shifted from one sidewalk to be built now to another (more needed) sidewalk to be built now, how does a *future* cost belong in the equation? And how could a future cost be calculated?

6. Temporary lane and sidewalk closures. Councilmember Berliner has written to the Committee expressing his desire for the bill to include more limitations on temporary closures of street lanes and sidewalks in urban areas (©231). He will be developing a specific amendment to the bill by June, and will ask the Committee to consider it.

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<u>Classification</u>	<u>Target Speed</u>	<u>Road/Lane Width</u>	<u>Curbside Width⁶</u>	<u>Bike Lane Width²</u>	<u>Sidewalk Width⁸</u>
<u>Freeway</u>	55-65 mph	12' lanes	Variable	none	none
<u>Controlled Major Highway¹</u>	50 mph	12' lanes	Variable	5'	5'
<u>Parkway¹</u>	urban: 25 mph suburban: 40 mph	11' lanes	25'	none	none
<u>Major Highway^{1,3}</u>	urban: 25 mph suburban: 35-40 mph rural: 45 mph ⁷	urban: 10.5' lanes suburban: 11' lanes rural: 12' lanes	urban: 20' min. elsewhere: 15'	5'	urban: 15' min. elsewhere: 5'
<u>Country Arterial⁴</u>	suburban: 40 mph rural: 40-45 mph ⁷	11' lanes		4'	suburban: 5' rural: none
<u>Arterial^{1,4}</u>	urban: 25 mph suburban: 35 mph rural: 40 mph ⁷	urban: 10' lanes suburban: 11' lanes rural: 12' lanes	urban: 15' min. elsewhere: 15'	urban: 4' suburban: 4' rural: 5'	urban: 10' min. elsewhere: 5'
<u>Minor Arterial^{1,4}</u>	urban: 25 mph suburban: 30 mph rural: 35 mph ⁷	urban: 10' lanes suburban: 10.5' lanes rural: 11' lanes	urban: 15' min. elsewhere: 15'	4'	5'
<u>Business District Street¹</u>	urban: 20 mph elsewhere: 25 mph	urban: 10' lanes elsewhere: 11' lanes	urban: 15' min. elsewhere: 15'	none	10'
<u>Industrial Street¹</u>	urban: 20 mph elsewhere: 25 mph	urban: 10' lanes elsewhere: 11' lanes	urban: 15' min. elsewhere: 15'	none	5'
<u>Country Road</u>	25 mph	20' road		none	suburban: 5' rural: none

<u>Classification</u>	<u>Target Speed</u>	<u>Road/Lane Width</u>	<u>Curbside Width⁶</u>	<u>Bike Lane Width⁷</u>	<u>Sidewalk Width⁸</u>
Primary and Principal Secondary Residential Streets (no curbs or parking) ⁵ (w/curbs, no parking) ⁵ (w/curbs, 1-side parking) ⁵ (w/curbs, 2-side parking) ⁵	25 mph	20' road 22' road 28' road 34' road	15'	3'	5'
Secondary Residential Street (no curbs, no parking) (w/curbs, no parking) (w/curbs, 1-side parking) (w/curbs, 2-side parking)	20 mph	20' road 20' road 20' road 24' road	15'	none	4'
Tertiary Residential Street	20 mph	20' road	12'	None	4'
Alley	15 mph	urban (2-way): 20' road urban (1-way): 16' road suburban: 16' road	None	None	none

Notes

- (1) Add 1 foot of width to each lane abutting an outside curb. Except in urban areas, add another 2 feet of width to each lane abutting an outside curb if a shared-use roadway is consistent with the Countywide Bikeways Functional Master Plan or the applicable area master or sector plan.
- (2) Bike lanes must be included when a road is constructed or reconstructed if bike lanes are consistent with the Countywide Bikeways Functional Master Plan or the applicable area master or sector plan. This bike lane width replaces the added width under note (1).
- (3) For an open-section Controlled Major Highway or Country Arterial add 5 feet of width on each road edge for a paved shoulder. A bike lane replaces this additional width.
- (4) For an open-section Arterial or Minor Arterial add 4 feet of width beyond the edge of the outside lane for a paved shoulder. If a bike lane is provided on a road edge, the bike lane replaces this additional width.
- (5) For a Primary or Principal Secondary Residential Street, the total curb-to-curb width must be the sum of the road width and any master-planned bike lane widths.
- (6) Curbside width is the area beyond each curb necessary for sidewalks, shared use paths, street trees and other landscaping, streetlights, utilities, and other elements. For open section roads and streets, the area beyond the shoulder is shown in the design standards approved by Executive regulation under Section 49-1(b).
- (7) Target speed for these classifications in suburban and rural commercial zones is 30 mph.
- (8) Sidewalks are required on both sides of roads and streets except for Secondary and Tertiary Residential Streets, where the Planning Board may require a sidewalk on either one or both sides of a street, depending on the housing density and potential use of sidewalks. Alleys must not have sidewalks.

Curb Return Radii

Background and Purpose

Curb returns are the curved connection of curbs in the corners formed by the intersection of two streets. A curb return's purpose is to guide vehicles in turning corners and separate vehicular traffic from pedestrian areas at intersection corners. The radius of the curve varies, with longer radii used to facilitate the turning of large trucks and buses. Larger radius corners increase the length of pedestrian crosswalks.

Related Thoroughfare Design Elements

- *Selecting the design vehicle*
- *Speed*
- *On-street parking*
- *Right-turn channelization*
- *Pedestrian refuge islands*

In CSS, the smallest practical curb return radii are used to shorten the length of the pedestrian crosswalks. Based on this function, this report suggests a general strategy for selecting curb return radii design criteria and discusses situations requiring larger design vehicles.

General Principles and Considerations

General principles and considerations regarding curb return radii include the following.

- Curb return radii should be designed to accommodate the largest vehicle type that will frequently turn the corner (sometimes referred to as the control vehicle). This principle assumes that the occasional large vehicle can encroach into the opposing travel lane as shown in Figure 10.7. If encroachment is not acceptable, then a larger design vehicle should be used.
- Curb return radii should be designed to reflect the "effective" turning radius of the corner. The effective turning radius takes into account the wheel tracking of the design vehicle utilizing the width of parking and bicycle lanes. Use of the effective turning radii allows a smaller curb re-

Effect of Curb Radii on Pedestrian Crossing Distance
(Compared to 15 ft. Radius)

Curb Return Radius (Feet)	Added Crossing Distance (Feet)	Added Crossing Time (Seconds) [1]
15	0	0
25	8	2
50	38	10

[1] Crossing time at 4 ft. per second.

turn radius while retaining the ability to accommodate larger design vehicles (Figure 10.8).

- In urban centers (C-5) and urban cores (C-6) where pedestrian activity is intensive, curb return radii should be as small as possible.
- On multi-lane thoroughfares, large vehicles may encroach entirely into the adjacent travel lanes (in the same direction of travel).
- To help select a design vehicle, identify bus routes to determine whether buses are required to turn at the intersection. Also check transit service plans for anticipated future transit routes. Map existing and potential future land uses along both streets to evaluate potential truck trips turning at the intersection.
- Apply curb return radii that are compatible with the design vehicle. Occasional turns by vehicles that are larger than the design vehicle could be accomplished by turning more slowly and possibly encroaching into oncoming travel lanes to complete the turn.
- Curb return radii of different lengths can be used on different corners of the same intersection to match the design vehicle turning at that corner. Compound, spiral, or asymmetrical curb returns can be used to better match the wheel tracking of the design vehicle (see AASHTO's Green Book for the design of spiral and compound curves).
- If large vehicles need to encroach into an opposing travel lane, consider placing the stop line for opposing traffic further from the intersection.

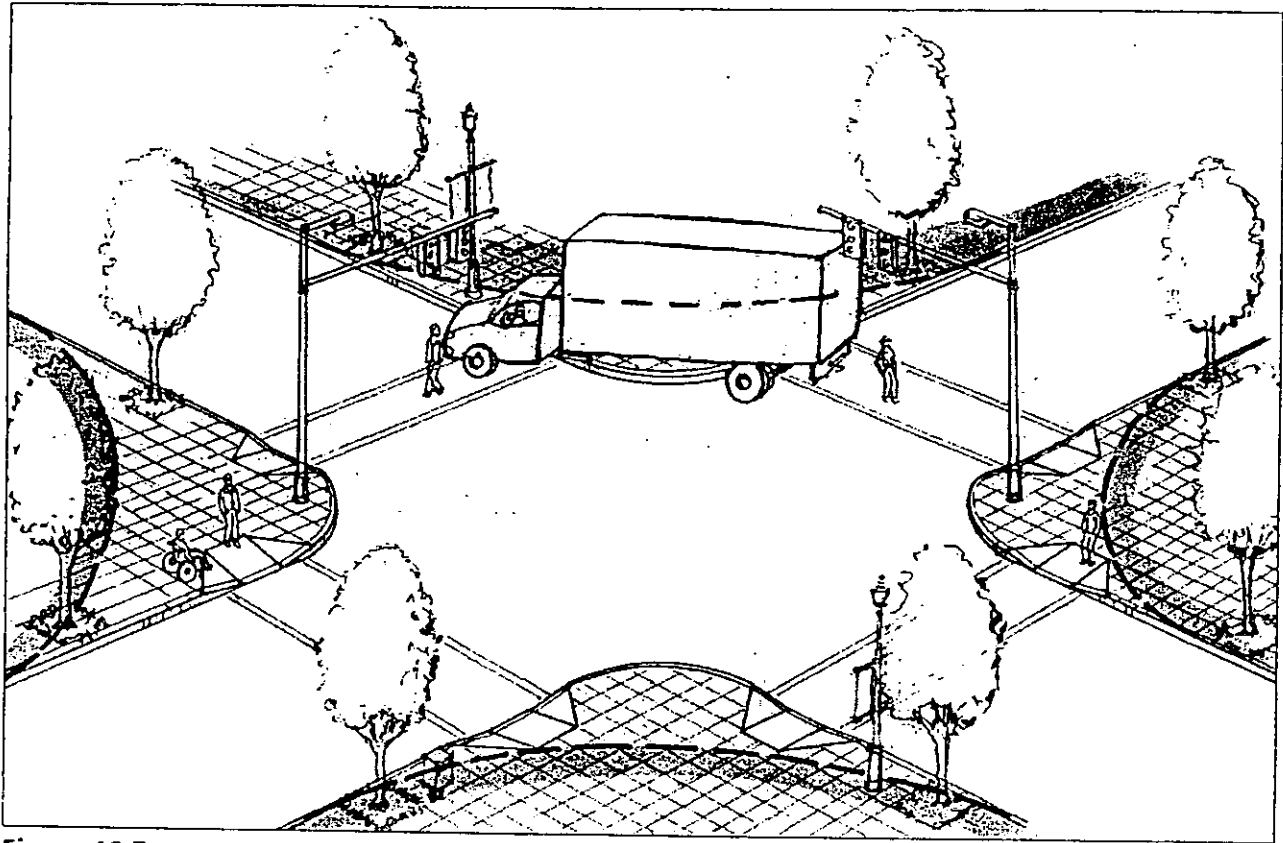


Figure 10.7 Smaller curb return radii shorten the distance that pedestrians must cross at intersections. The occasional turn made by large trucks can be accommodated with slower speeds and some encroachment into the opposing traffic lanes. Source: Kimley-Horn and Associates Inc.

Recommended Practice

Flexibility in the design of curb return revolves around: (1) choice of design vehicle, (2) combination of dimensions that make up the effective width of the approach and receiving lanes and (3) the curb return radius itself. The practitioner needs to consider the trade-offs between the traffic safety and operational effects of infrequent large vehicles and the creation of a street crossing that appears reasonable to pedestrians. The guidelines assume arterial and collector streets in urban contexts (C-3 to C-6) with turning speeds of city buses and large trucks of 5 to 10 mph. The guidance is not applicable to intersections without curbs.

Recommended practices include the following.

- In urban centers (C-5) and urban cores (C-6) at intersections with no vehicle turns, the minimum curb return radii should be 5 ft.

- A typical minimum curb return radius of 10 to 15 ft. should be used where:
 1. High pedestrian volumes are present or reasonably anticipated;
 2. Volumes of turning vehicles are low;
 3. The width of the receiving intersection approach can accommodate a turning passenger vehicle without encroachment into the opposing lane;
 4. Passenger vehicles constitute the majority of turning vehicles;
 5. Bicycle and parking lanes create additional space to accommodate the "effective" turning radius of vehicles;
 6. Low turning speeds are required or desired; and
 7. Occasional encroachment of turning school bus, moving van, fire truck, or oversized delivery truck into an opposing lane is acceptable.

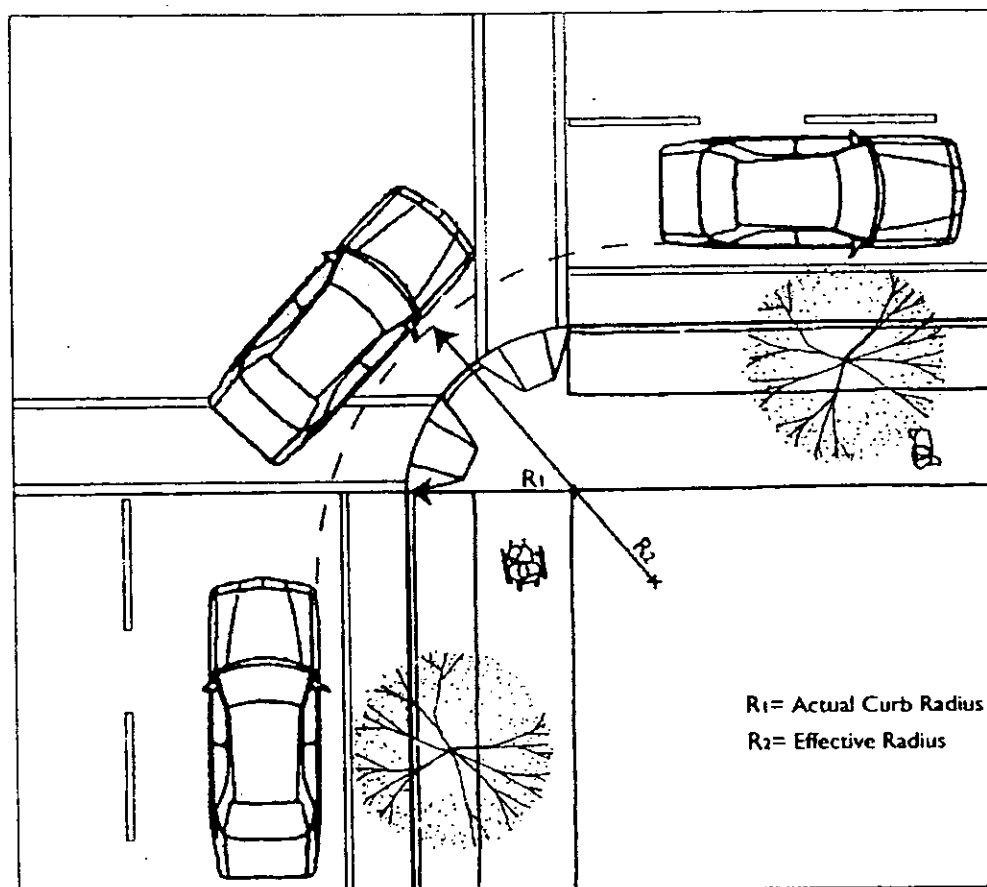


Figure 10.8 The existence of parking and bicycle lanes creates an "effective" turning radius that is greater than the curb return radius. Source: Community, Design + Architecture, adapted from the *Oregon Bicycle and Pedestrian Plan*.

- Curb radii will need to be larger where:
 1. Occasional encroachment of a turning bus, school bus, moving van, fire truck, or oversized delivery truck into the opposing lane is not acceptable;
 2. Curb extensions are proposed or might be added in the future; and
 3. Receiving thoroughfare does not have parking or bicycle lanes and the receiving lane is less than 12 ft. in width.

Recommendations for Curb Radii on Transit and Freight Routes

Trucks routes should be designated on a minimum number of appropriately selected streets to reduce the impact of large turning radii on pedestrian routes. Where designated local or regional truck routes con-

flict with high pedestrian volumes or activities, analyze freight movement needs and consider re-designation of local and regional truck routes to minimize such conflicts.

On bus and truck routes, the following guidelines should be considered.

- Curb return radii design should be based on the effective turning radius of the prevailing design vehicle.
- Where the potential for conflicts with pedestrians is high and large vehicle turning movements necessitate curb radii exceeding 50 ft., evaluate installation of a channelized right-turn lane with a pedestrian refuge island (see the section on pedestrian refuge islands in Chapter 9 and the section on channelized right-turn lanes in Chapter 10). To better accommodate the path of large

vehicles use a three-centered compound curve in the design of the island (see the AASHTO Green Book's Chapter 9 for design guidance).

- Where frequent turning of large vehicles takes place, avoid inadequate curb return radii as it could potentially cause large vehicles to regularly travel across the curb and into the pedestrian waiting area of the roadside.

Justification

Intersections designed for the largest turning vehicle traveling at significant speeds with no encroachment results in long pedestrian crossings and potentially high-conflict areas for pedestrians and bicyclists. Radii designed to accommodate the occasional large vehicle will allow passenger cars to turn at high speeds. In CSS, the selection of curb returns ranging from 5 to 25 ft. in radius is preferable to shorten pedestrian crossings and slow vehicle turning speeds to increase safety for all users.

Channelized Right-Turns

Background and Purpose

In urban contexts, high-speed channelized right turns are often inappropriate because they create conflicts with pedestrians. Under some circumstances, providing channelized right-turn lanes on one or more approaches at a signalized intersection can be beneficial, but unless designed correctly, these right-turn lanes can be undesirable for pedestrians. According to the *Oregon Bicycle and Pedestrian Plan* a well-designed channelization island can:

- Allow pedestrians to cross fewer lanes at a time and judge conflicts separately;
- Provide refuge for slower pedestrians;
- Improve accessibility to pedestrian push-buttons; and

Related Thoroughfare Design Elements:

- Curb return radii
- Crosswalks
- Bicycle lanes at intersections

- Reduce total crossing distance, which provides signal-timing benefits.

Right-turning drivers may not have to stop for the traffic signal when a poorly designed channelized right-turn lane is provided. Even where pedestrian signal heads are provided at the intersection, pedestrians are usually expected to cross-channelized right-turn lanes without the assistance of a traffic signal. Most channelized right-turn lanes consist of only one lane and the crossing distance tends to be relatively short. However, drivers are usually looking to their left to merge into cross-street traffic and are not always attentive to the presence of pedestrians.

General Principles and Considerations

The general principles and considerations regarding channelized right turns include the following.

- Avoid using channelized right-turn lanes where pedestrian activity is significant. If a channelized right-turn lane is unavoidable, use design techniques described to lessen the impact on pedestrians.
- Exclusive right-turn lanes should be limited. A right-turning volume threshold of 200–300 vehicles per hour is an acceptable range for the provision of right-turn lanes. Once determined that a right-turn lane is necessary, a well-designed channelization island can help slow down traffic and separate conflicts between right-turning vehicles and pedestrians (Figure 10.9).
- If an urban channelized right-turn lane is justified, design it for low speeds (5 to 10 mph) and high-pedestrian visibility.
- For signalized intersections with significant pedestrian activity, it is highly desirable to have pedestrians cross fully under signal control. This minimizes vehicle-pedestrian conflicts and adds to the comfort of pedestrians walking in the area.
- Consider channelized right-turn lanes at multi-lane all-way stop controlled intersections to provide pedestrians an additional refuge among the complex right-of-way patterns that affect traffic movements.



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Appendix D: Curb Return Radii Design Guidelines

I. Overview and Purpose

The intent of the curb return radii design guidelines is to establish a procedure that allows flexibility in designing curb radii to reflect conditions of specific locations, while assuring that the *result will yield the smallest radii that are feasible* to accommodate the specified design vehicle.

The primary reason for minimizing curb radii is to help provide shorter crossings for pedestrians. In general, the distance a pedestrian must cross to reach the opposite curb will decrease as the curb radius decreases. Similarly, the larger the radius, the greater the distance the pedestrian has to traverse and the more the pedestrian is potentially out of the line-of-sight of the driver. Smaller radii can also serve as a traffic calming design feature, requiring vehicles to turn at slower speeds, depending on the width of the street.

Smaller curb radii, therefore, serve to:

- Minimize the (unprotected) distance pedestrians need to cross,
- Allow for better alignment of the crosswalk with the connecting sidewalks (i.e., provide a continuous path of travel),
- Assure adequate space at the corner for proper placement and alignment of ADA-compliant curb ramps (typically, one per each direction of travel is desired),
- Moderate the speeds of turning vehicles,
- Improve visibility of drivers and pedestrians,
- Result in improved compliance with “No Turn On Red” regulations.

While the overall intent is to keep radii small and improve pedestrian crossings, curb radii will be designed to accommodate the expected type and volume of vehicle turning at the intersection. Properly designed curb radii will provide sufficient space for the expected vehicles to maneuver through their turns safely, while minimizing conflicts between cars, trucks, buses, bicyclists and pedestrians. The design should also take into account the typology of the two intersecting streets, the level of pedestrian activity expected, the location of crosswalks, curb ramps, presence or absence of bike lanes, pedestrian refuge islands, curb extensions, bus stops and on-street parking, and whether the intersection is signalized or unsignalized.

II. Design Criteria

The following guidelines are to be used to determine the curb radii at any given intersection. For the purposes of this process, the AASHTO Green Book’s “crawl speeds” are assumed for the turning speeds of vehicles.

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It is important to note that, as with any document of this nature, these guidelines are intended to provide guidance and direction when designing streets and should be flexible to account for the specific traffic, vehicle and roadway conditions at any given location, and be sensitive to any unique or unusual situations. Sound engineering and planning judgment shall be used to produce designs in keeping with the context of the adjacent land uses and surrounding street network.

Approach

The approach outlined in this section is different for **Local** and **Non-Local** streets, given the different nature and context of each of these typologies. The discussion on **Non-Local** streets is presented first as this is typically the more complex of the two street types.

a) Non-Local Streets

Determination of Appropriate Design Vehicle

The appropriate curb radii to be used at the intersection of two non-local streets is initially based on the type and frequency of vehicle (the “design vehicle”) expected to traverse the intersection under normal conditions. While often not readily available, this information can be determined by a variety of methods, such as field observations, vehicle classification counts, and assumptions and projections based on future land uses.

In the absence of specific information regarding the types and numbers of vehicles expected, Table 1 shall be used to select the appropriate design vehicle:

Table 1 – Design Vehicle for Non-Local Street Intersections

	Local	Main	Avenue	Boulevard	Parkway
Local	See Table 4	Pass. Veh.	School Bus	SU-30	B-40
Main	-	SU-30	SU-30	B-40	B-40
Avenue	-	-	B-40	B-40	WB-50
Boulevard	-	-	-	WB-50	WB-50
Parkway	-	-	-	-	WB-62

Potential Encroachment for Turning Vehicles

Once a design vehicle is selected, the designer must make assumptions regarding the potential encroachment into various travel lanes on the receiving street. These assumptions relate to the ability of the design vehicle to turn from one street into the available traffic lanes on the receiving street. The possible encroachment is based on a number of factors, including the street typology, the number and width of traffic lanes, available sight distance, the speed and volume of vehicles on each



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street and the presence or absence of onstreet parking. As a result, different curb radii may be designed for each corner of an intersection.

While it is acknowledged that occasional encroachment by larger vehicles into adjacent or opposing lanes of traffic will occur, the goal is to minimize as much as possible conflicts between vehicles, pedestrians, bicyclists, and other users of the street, while providing the minimum curb radii appropriate for the given situation.

Tables 2 and 3 are to be used as a guide to determine the potential/possible encroachment for vehicles turning at signalized and unsignalized intersections, given the factors described above. Figure 1 graphically illustrates the various encroachment scenarios (“cases” shown in Tables 2 and 3) that may be used for the design vehicle in determining the appropriate curb radii.

Table 2 – Allowable Encroachment for Signalized Intersections

From\To*	Local	Main	Avenue	Boulevard	Parkway
Local	Table 4	Case B	Case B	Case B	Case B
Main	Case D	Case C	Case B**	Case B	Case B
Avenue	Case D	Case C	Case B**	Case B	Case B
Boulevard	Case C	Case C	Case B**	Case B	Case B
Parkway	Case C	Case C	Case B**	Case B	Case B

Table 3 – Allowable Encroachment for Unsignalized Intersections

From\To*	Local	Main	Avenue	Boulevard	Parkway
Local	Table 4	Case C	Case A	Case A	-
Main	Case D	Case C	-	-	-
Avenue	Case D	-	-	-	-
Boulevard	Case D	-	-	-	-
Parkway	-	-	-	-	-

*The column along the left side of the table indicates the street *from* which the vehicle is turning; the headings indicate the *receiving* street.

**Case B should be assumed, unless the Avenue only has one receiving lane, whereupon Case A should be assumed.

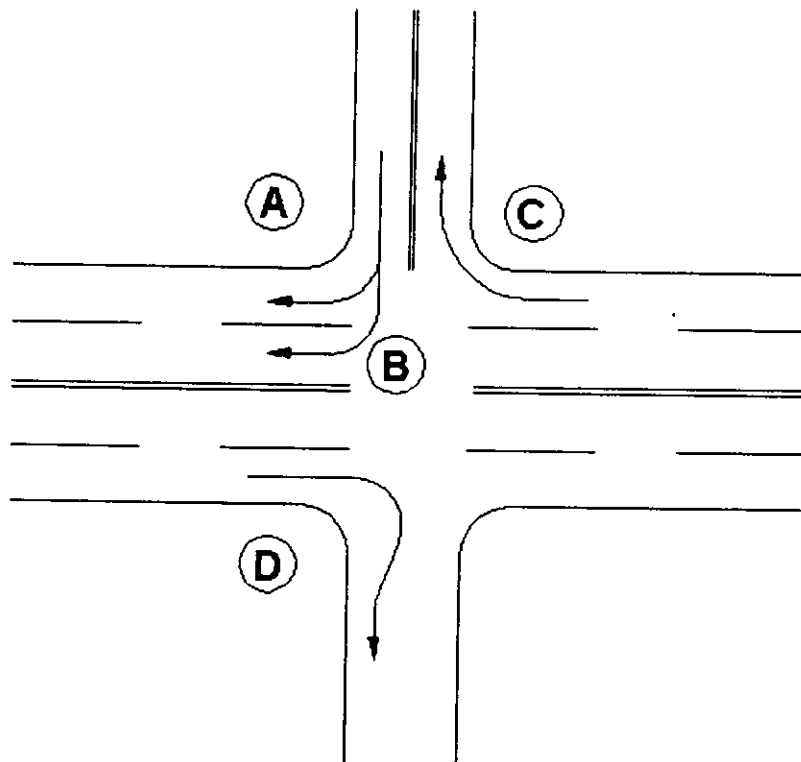
The possible encroachment is intended to be more flexible at signalized intersections (i.e., resulting in smaller radii), since it is assumed that a) larger vehicles can wait for a green signal to assure adequate space to safely complete their turn, and b) a higher level of pedestrian activity is expected or desired.



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FIGURE 1
ENCROACHMENT FOR INTERSECTIONS
USE IN CONJUNCTION WITH TABLES 2 AND 3
(NOT TO SCALE)



LETTER CORRESPONDS TO
CASE LISTED IN TABLES 2 AND 3

NOTE: LANE WIDTHS ARE NOT CONSIDERED



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b) Local Streets

As stated previously, determination of the appropriate curb radii is based on many factors. In the case of *Local Streets*, curb-to-curb width must also be considered. In most cases, the width of the street is the critical factor in determining the necessary curb radii for *Local Streets*.

While *Local Streets* are typically narrower than *Non-Local Streets*, there is also more flexibility in applying the design vehicle encroachment guidelines, since it is generally assumed that the full width of available pavement can be used to “receive” the turning vehicle. This, of course, must take into account the traffic volumes, function, adjacent land uses and specific conditions of the street being designed.

Table 4 indicates the curb radii to be used for the intersections of *Local Streets*. Again, while the goal is to provide the smallest radii possible, the design should be tested to be sure it can adequately accommodate the *expected* typical design vehicle, based on the specific traffic and roadway conditions of the project area.

Table 4 - Curb Radii for Local Street Intersections

From\To	R/Narrow	R/Medium	R/Wide	C/Narrow	C/Wide	Industrial
R/Narrow	35					
R/Medium	20	15				
R/Wide	15	15	10			
C/Narrow	20	15	25	35		
C/Wide	15	15	15	30	10	
Industrial	30	25	15	40	25	50

R = Residential

C = Commercial

III. Other Factors Affecting Curb Radii

As previously stated, the determination of the appropriate curb radii for any given location is influenced by many different and varied factors. For the purpose of achieving the goals of Charlotte’s *Urban Street Design Guidelines*, the overwhelming consideration for most street types is for safety, including providing safer and shorter pedestrian crossings.

While minimizing the curb radii is the desired outcome, other factors must be evaluated to assure that the design is adequate before a final determination can be made.

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Additional factors to consider include:

- *The overall street pattern* – depending on the size and layout of the adjacent street system, it may be appropriate to design smaller radii at most intersections (e.g. along a *Main Street*), while accommodating larger vehicles at fewer select locations along designated routes.
- *The presence of a bike lane* – the additional width created by a bike lane makes the effective curb radius larger. Therefore, the actual curb radius can usually be smaller when a bike lane exists.
- *The presence of a raised median or pedestrian refuge island* - may require larger radii to prevent vehicles from encroaching onto the median. Alternatively, particularly for “gateway” medians on Local Streets, medians may have aprons to allow larger vehicles to turn without damaging landscaping or curbs.
- *Skewed or oddly shaped intersections* - may dictate larger or smaller radii than the guidelines would otherwise indicate.
- *Lane configuration or traffic flow* – intersections of one-way streets, locations where certain movements are prohibited (left or right turns), or streets with uneven numbers of lanes (two in one direction, one in the other) will also affect the design of curb radii.
- *Onstreet Parking* – the presence or absence of onstreet parking will directly affect the curb radii required to accommodate the design vehicle. **Table 5** may be used where *permanent full-time* onstreet parking is allowed and accommodated on *both streets* at an intersection.

Table 5 – Curb Radii with Permanent Full-time Onstreet Parking*

From\To	Local	Main	Avenue	Boulevard	Parkway
Local	15	20	25	30	-
Main	20	20	25	30	-
Avenue	25	25	25	30	-
Boulevard	30	30	30	35	-
Parkway	-	-	-	-	-

* This table should not be used where parking is either part-time only or occurs infrequently.

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April 11, 2007

Memorandum

To: Glenn Orlin, Deputy Council Staff Director
Via: Larry Cole, Transportation Division, MNCPPC
From: Karen Kumm Morris, Community Based Planning, MNCPPC
Subject: **Major Business District Street Classification**

Support for the Proposed Roadway Classifications

The proposed classifications provide needed guidance for the functional application of the various roadway classifications for the master planning efforts. Also, the inclusion of several new classifications such as the Parkway and the Minor Arterial are needed to bring the road code up to date.

Need for a Major Business District Street Classification

There is a need to provide one additional roadway classification, a Major Business District Street to serve significant through movement and local traffic through an urban area. This will allow a major roadway serving Metro Policy Areas to have design standards and operational decisions that support local access and the transit function of the area.

The creation of a Major Business District Street recognizes that roadways need to change function and character as they enter into and pass through urban areas. Examples of such roadways are Wisconsin Avenue, East West Highway in Bethesda, and Georgia Avenue and Colleyville Road in Silver Spring. These roadways currently serve significant through traffic and local traffic as well.

The current proposal designates Wisconsin Avenue, Georgia Avenue and other significant roadway as a Major Highway classification. By functional definition, these significant roadways are meant "nearly exclusively for through movement of vehicles at a moderate speed". This type of classification for major roadways within urban areas will create problems because the highway classification will continue to guide operational decisions that give greater weight to through movement traffic. For example, off peak parking along a designated highway is not permitted except through waivers. By designating such significant roadways as a Major Business District Street, local traffic and pedestrian movements would have greater use of the roadway during off peak periods.

A Major Business District Street is distinguished from a Business District Street in that it is intended to carry a significant amount of through movement traffic and local traffic. A Business District Street, as the Council staff recommends, is a road meant for circulation in commercial and mixed-use zones, not for through movement. Thus, there is a need for a classification that serves significant through movement and local traffic within urban areas.

March 19, 2007

Memorandum

To: Glenn Orlin, Deputy Council Staff Director
Via: Larry Cole, Transportation Division, MNCPPC
From: Karen Kumm Morris, Community Based Planning, MNCPPC

Subject: Needed Revisions for Tree Standards in the Road Code Revisions

Street Trees in Medians – Section 49-32 (e)

The proposed amendment allows trees to be planted in medians and specifies that only small trees (less than 4 inch caliper at maturity) can be planted in 8 foot wide medians and only larger trees (greater than 4 inch caliper at maturity) can be planted in 12 foot wide medians.

This language is intended to guide appropriately sized trees to differ sized medians. The problem is that small trees with less than 4 inch caliper trunks usually are short trees with low canopies that will block sight distances and conflict with truck traffic. Drivers need to be able to see under the canopy of median trees. Tall growing, shade trees are needed for good sight distance and a clear zone free of branches.

There is also an argument that small trees in the median are safer than a large tree, should a vehicle jump the curb and hit the tree. A tall growing shade tree in the median has the same setback from the median's curb as the tall growing, shade street tree located along the outside curb. Tall growing shade trees are the standard type of tree used for streetscaping because of their canopies are high allowing for good visibility and branch clearance.

Recommended language revisions – Lines 1178 - 1184

The median must be at least:

8 feet wide to accommodate tall growing, shade trees with spacing that will ensure good sight distances.

(f) A landscape panel abutting a closed-section road must extend at least 5 feet from the curb and be at least 8 feet long. Trees planted in landscape panels along 'urban' roads must be at least 25 feet apart unless the tree spacing is interrupted by a public street or driveway.

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Deleted: that will grow to no more than a 4 inch diameter at maturity; and
12 feet wide to accommodate any tree that will grow larger than a 4 inch diameter at maturity.

Deleted: at least 30

- Raised medians in low-speed urban contexts should be constructed with vertical curbs to provide refuge for pedestrians, access management and a place to install signs, utilities, and landscaping. In snow conditions, raised medians improve delineation of the median. If emergency access is a concern, mountable curbs should be considered in special locations (where medians are carried across intersections, access managed thoroughfares near fire stations, or within 200 to 300 ft. of an intersection approach that frequently experiences long queues). Mountable medians can be super-reinforced with grass-concrete pavers or concrete with added rebar.
- Narrow medians (4 ft. or less) should only be used to restrict turning movements, separate opposing directions of traffic, and to provide space for traffic control devices (Figure 9.6A).
- In constrained rights-of-way, consider narrower medians with attractive hardscape and urban design features in lieu of planting, or provide a discontinuous median as right-of-way permits.
- Landscaping on medians should be designed in a manner that does not obstruct sight-distance triangles. In general, plants should be trimmed to not more than a 2.5-ft. maximum height, while trees should have no branches in sight lines lower than 8 ft. from the ground. Small caliper trees (less than 4 in.), properly pruned, may be considered on medians adjacent to turn lanes up to 50 ft. back from the median nose. A 6-ft. wide median is adequate to support the healthy growth of small caliper trees (less than 4 in.), but a minimum 10-ft. wide median should be used for larger caliper trees.

Recommended Practice

Table 9.1 presents the recommended practice for median widths for various functions within low speed major thoroughfares (35 mph or less). Flexibility in median width design revolves around the median's function, appurtenances to be accommodated in the median and available right-of-way. The practitioner needs to consider the trade offs between the provision of a median and other design elements, particularly in constrained rights-of-way. The recommendations assume arterial and collector streets in urban contexts

(C-3 to C-6) with operating speeds of 35 mph or less. Most of the guidance in this report is not applicable to flush or depressed medians or to raised medians with mountable curbs. Note that median widths are measured from face-of-curb to face-of-curb.

Additional Guidelines

Additional guidelines regarding medians also include the following:

- At lower urban speeds there is no need to provide an offset between the median curb face and the travel lane;
- Design the median nose using AASHTO guidelines ensuring proper end treatments to guide vehicles away from the median and pedestrian refuges;
- Design median turn lanes, tapers and transitions using AASHTO guidelines for intersection design; and
- At intersection crossings, extend the median nose beyond the crosswalk to provide an enclosed pedestrian refuge (Figure 9.6).

Trees and Landscaping in Medians

In urban areas, the community may find it desirable to plant trees in raised curbed medians for aesthetic purposes. In general, the guidance in this report is consistent with AASHTO in regards to low-speed urban thoroughfares. Additional information and mitigative strategies on trees within the public right-of-way may be found in *A Guide for Addressing Collisions with Trees in Hazardous Locations* (TRB 2003). General guidelines for median trees include the following.

- Small caliper trees can be healthy in medians that are at least 6-ft. wide, as long as a critical root area is provided. A 10-ft. wide median is recommended for larger trees. Consult an urban forester for guidance on health requirements for trees in medians. Consider the roadside safety issues of large caliper trees. AASHTO recommends avoiding trees in medians where speeds are greater than 45 mph and recommends special barriers designed to redirect vehicles if planting trees with diameters greater than 4 in. at maturity.

PURPOSE Of a Green Streets Amendment

The Road Code bill should be amended to mandate that a minimum quantity of stormwater be retained and treated on-site, within the road right-of-way, preferably using vegetation-based stormwater management techniques.

This should be achieved using the following principles of roadway design:

- Incorporate bioretention features to the maximum extent practicable, particularly by utilizing landscaping units for this purpose[†].
- Utilize evolving design standards to ensure that Montgomery County's roadway stormwater management techniques keep pace with the national and international state of the art.
- Minimize impervious surfaces to the maximum extent practicable, once all transportation modes, particularly pedestrian and bicycling needs, are considered.¹
- Utilize "open section" roads instead of "curb and gutter" roads wherever practicable.
- Preserve existing rural and rustic roads/

[†] **Bioretention definition:** *Bioretention* combines engineered soils and vegetation in a dug-out, trenched, or depressed area to collect, treat, store, filter, and/or infiltrate stormwater runoff. Bioretention may be incorporated into normally-landscaped roadway features such as medians, cul de sacs, traffic circles, curb extensions, planters, street tree containers, and swales.

TECHNICAL PROPOSAL

BASIC DESCRIPTION: Each category of road is required to retain a certain volume of stormwater on-site, within the road right-of-way. Roadway designers would use a prioritized “toolbox” of stormwater retention techniques to meet or exceed the stormwater retention requirements. Vegetative infiltration techniques are preferred, due to their superior performance. Although road designers are free to choose from all the tools included in the law’s stormwater toolbox, specific combinations are suggested for different categories of roadways, based on the particular needs and challenges of that road category.

The Preferred Tools listed for each roadway category are further explained in the Toolbox section, and are documented with technical, web-based references. †

TECHNICAL PROPOSAL:

RULE: All roadways must be designed to meet or exceed the following standards for on-site stormwater retention, using one or more of the on-site techniques specified by this law:

Stormwater Performance Standards, by Roadway Category:

- **ULTRA-URBAN[§]**
 - Road Code street categories included:
 - Business District Streets
 - Principle Secondary Residential Streets
(w/ curbs, & 1- or 2-sided parking)
 - Secondary Residential Streets
(w/curbs, 1-,2-, or no-sided parking)
 - Tertiary Residential Street
 - **Minimum stormwater retention:** 1/2 ”

† Detailed design drawings and specifications for roughly ten green street techniques or technique components, including bioswales; tree boxes; planters; curb extensions, and concrete inlets are presented on Portland’s Green Streets web page at: www.portlandonline.com/bes/index.cfm?c=44213&

§ **Ultra-Urban:** refers to “downtown” and Central Business District neighborhoods with high densities of buildings, typically mixtures of retail, residential, and other adjacent uses, buildings fronting on the street/ sidewalk; and high overall imperviousness.

Basis: The Silver Spring Central Business District Sector Plan (2001) calls for stormwater quality treatment on-site for redevelopment projects, but allows for waiver payments into a stream restoration fund in lieu of stormwater quantity volume treatment. The State of Maryland stormwater design manual requires redevelopment projects of 5000 sq. ft. or larger to treat a portion of their stormwater on-site.²

Preferred tools:

- Stormwater planters
- Street Trees with Structural Cells (or other Proven Stormwater Retention ability)
- Bioretention Medians
- Permeable/ pervious pavements

(Note: Underdrains and impermeable liners will be required, as well as overflow drainage/ conveyance; the latter for all categories.)

- Other Options: Underground SW treatment devices

• **URBAN**

- Road Code street categories included:

Arterials
Industrial Streets
Primary Residential Streets
Secondary Residential Streets
Tertiary Residential Streets

- Minimum stormwater retention: 1"

Example of a similar standard: the Anacostia Waterfront Corporation proposed stormwater standard is on-site retention with beneficial reuse of 1" of rain over 24 hours with a 48-hour antecedent dry period.³ This standard applies to all projects including streets and sidewalks as well as buildings and parking lots.

- Preferred tools:
 - Stormwater planters
 - Street Trees with Structural Cells
 - Bioretention Medians
 - Bioretention Swales (Bioswales)

(Underdrains will be necessary, but there may be a few cases where greater infiltration can be achieved e.g. where impermeable liners will not be necessary, as appropriate given soil type, etc.)

- **SUBURBAN**

- Road Code street categories included:

- Minor Arterials
 - Primary Residential Streets (with curbs)
 - Principle Secondary Residential Streets
 - Secondary Residential Streets
 - Tertiary Residential Streets

- Minimum stormwater retention: 2"

Example of a similar standard: The Seattle Public Utilities Natural Drainage System Program (that has now completed five major projects) uses a multi-faceted set of goals that includes maximizing on-site retention so as to protect streams from the one to two-year storm event.⁴ The one-year, 24-hour storm size for Montgomery County is 2.6".

- Preferred tools:
 - Bioretention Cul-de-Sacs
 - Bioretention Medians
 - Bioretention Swales (Bioswales)
 - Bioretention curb extensions
 - Open Section Roads
 - Permeable Pavements (for sidewalks)

(Underdrains will be necessary, but there may be cases where greater infiltration can be achieved e.g. where impermeable liners will not be necessary.)

- **RURAL**

- Road Code street categories included:

- Country Roads
 - Primary Residential Streets (no curbs)
 - Principle Secondary Residential Streets
 - Secondary Residential Streets (no curbs, no parking)

- **Minimum stormwater retention: 3"**

Example: open section roads are applied by the Montgomery Planning Board for rural developments,⁵ and these inherently involve the use of swales. The Pembroke development in Frederick County, MD utilized open section roads with bioretention swales and incorporated a design standard of 3" (the two-year storm).⁶

- **Preferred tools:**
 - Bioretention Swales
 - Bioretention Medians
 - Open Section Roads
 - Sheet flow to forested areas

- **HIGHWAYS/ PARKWAYS**

- **Road Code street categories included:**

- Freeways
 - Controlled Major Highways
 - Major Highways
 - Parkways

- **Minimum stormwater retention: 3"**

Examples: The Prince George's County highway LID project yielded an average of 35% runoff volume reduction over pre-existing levels for this highway – bioretention retrofit project.⁷

- **Preferred tools:**
 - Bioretention Swales
 - Bioretention Medians

MEMORANDUM RE: ROAD CODE REVISIONS

TO: Marilyn Praisner, *Council President*
Montgomery County Councilmembers

CC: Glenn Orlin, *Council Staff*
Ike Leggett, *County Executive*
Jennifer Hughes, *Special Assistant to the County Executive*

FROM: Diane Cameron, *Montgomery County Stormwater Partners*
Anne Merwin, *Potomac Conservancy, member of the Stormwater Partners*
Cheryl Cort, *Coalition for Smarter Growth*
Jack Cochrane, *Montgomery Bicycle Advocates*
Eric Gilliland, *Washington Area Bicyclist Association*

SUBJECT: Road Code Revisions

DATE: 4/26/07

President Praisner and honorable Councilmembers:

As representatives of the environmental, bicycling, and smart growth communities, we would like to request your support in successfully completing the ongoing Road Code revisions. The Road Code revisions that the T&E Committee is currently considering are incredibly important to the future of our county. By ensuring that our roads serve all types of users and have the smallest stormwater footprint possible, a well-executed Road Code revision will enhance quality of life for all Montgomery County residents. We are tremendously excited that Councilmember Floreen and her co-sponsors opened the door for this process to begin, and we look forward to working with all of you to bring it to successful completion.

Two elements are absolutely necessary in order to make the Road Code revisions a success: (1) strong policy guidance from the Council, and (2) standards designed by a joint Council-Executive committee, led by a neutral party, with advice from experts in the field.

- 1) **Strong policy guidance from the Council.** Policy guidance is important in any legislation, but is especially important for the Road Code because of its technical nature. The design elements that make roads user- and environmentally-friendly are both highly technical and highly context-specific. We support the prompt passage of a Road Code bill that provides a clear and strong purpose statement for our Road Code and a set of policies and numeric performance standards for roadway design and stormwater management. These policies and standards will define the goals of the Road Code and how each road should serve both users and the environment. This bill as passed by the Council will then serve as a basis for further review and refinement by a multi-stakeholder Technical Advisory Committee.
- 2) **Standards designed by a multi-stakeholder, joint Council-Executive committee, led by a neutral party, with expert technical advisors.** Many different groups have a stake in the revision of our County's Road Code, from pedestrians and bicyclists, to people in wheelchairs, to environmentalists seeking relief for our degraded streams, to transit users and drivers alike seeking smoothly-flowing and reliable commutes. DPWT and other Executive agencies, along with Parks and Planning officials, must have clear and practical design and

performance standards. All of these groups need a formal structure that will provide the parties with a fair and neutral venue to discuss potentially competing needs, as well as the technical expertise necessary to solve them.

- Joint Council-Executive Committee. The Council and the Executive must commit to working together and empowering a technical advisory committee to create Road Code standards and specifications. As Arlington County's Transportation Director testified to the T&E Committee, Arlington's successful road design overhaul is due in large part to the fact that all the competing professionals (engineering, planning, environmental departments, etc.) work together under the County Manager. Montgomery County lacks this advantage, with its roadway facility planning and design decisions fragmented among several authorities. We can, however, create unified leadership for the Road Code by creating a joint Council-Executive advisory committee. In fact, this joint Council-Executive approach was successful in creating the 2000 Stormwater Working Group that led to the Water Quality Protection Charge and Fund.
- Neutral Leadership. If the Road Code is to successfully balance many competing needs and interests, the advocates for those interests must also be evenly balanced during the technical advisory committee's discussions. The only way to ensure such an even playing field is to provide a neutral facilitator who will guide committee discussions with an even and unbiased hand. This is in contrast to the traditional executive rulemaking process, which is not an appropriate solution for the unique challenges presented by the Road Code. A traditional, executive-led process is likely to enable one agency to dominate, whereas this process needs to be stakeholder-driven, not staff-dominated. While this may be appropriate for rulemakings with narrower implications and effects, it is not appropriate for an issue involving as many diverse and crucial community stakeholders as the Road Code. The technical experts to be hired by the committee (see below) are a natural fit to serve as the group's neutral facilitators.
- Expert Technical Advisors. Hiring expert technical advisors will ensure that whatever "Green & Complete" techniques are included in the Road Code function effectively and are consistent with state of the art practice in the United States. Montgomery County simply does not have the necessary in-house expertise to design a cutting edge, "green and complete streets" road code. In addition, as stakeholders in the design and functioning of our roads, we understand the principles and techniques needed to achieve our goals but we often do not have the expertise necessary to devise and harmonize technical road code specifications. The Road Code is a highly technical law, with many potential conflicts, and we need an expert to ensure our revisions are successful.

Thank you for your consideration, and for your support in successfully completing the Road Code revisions. We believe that although challenging, with good policy guidance and a jointly-sponsored, neutrally-lead, expert-guided rulemaking process, the new Road Code will make Montgomery County a national leader in both green and complete streets design.

Sincerely,

Diane Cameron
Stormwater Partners

Anne Merwin
*Potomac Conservancy
Stormwater Partners*

Cheryl Cort
*Coalition for
Smarter Growth*

Jack Cochrane
*Montgomery Bicycle
Advocates*

Eric Gilliland
*Washington Area
Bicyclist Assoc.*



Coalition for Smarter Growth

Choices for our communities, Choices for our region

April 26, 2007

Chair Nancy Floreen,
Hon. Valerie Ervin, and Hon. George Leventhal
Transportation & Environment Committee
Montgomery County Council
100 Maryland Avenue
Rockville, MD 20850

Dear Members of the Committee:

I am providing comments on behalf of the Coalition for Smarter Growth. The Coalition for Smarter Growth is a D.C.-based regional non-profit organization that works to ensure transportation and development decisions are made with genuine community involvement and accommodate growth while revitalizing communities, providing more housing and travel choices, and conserving our natural and historic areas.

We greatly appreciate the responsiveness of the Committee and Council staff to our concerns as we have expressed them through our organization's testimony and as part of the Complete and Green Streets group. We applaud the Council's effort to address the outmoded Road Code which is failing to serve the full range of needs of Montgomery County travelers, communities and businesses. We greatly appreciated the input of the panel of experts on April 17 at the T&E work session. We believe that Arlington County's experience can provide valuable insight into how to increase the capacity and ability of non-motorized travelers to safely use public rights of way while not overburdening adjacent neighborhoods with spillover traffic or reducing capacity of the roadway to serve motorists well.

We would like to make some specific comments on the bill as currently drafted by staff.

Complete & Green Streets Statement of Purpose: We ask that the bill incorporate our proposed "Complete and Green Streets" purpose statement.

"Major Business District Street:" First, we would like to associate ourselves with many of the comments and concerns of the Planning staff and are pleased to see that many of these recommendations are incorporated into the amended bill. In particular, we strongly support the added curbside widths and the sidewalk widths. We concur with Planning staff regarding the need to include Major Highways in urban areas as a "Major Business District Street" classification. This designation can be refined in the regulations development process but it is critical to recognize that

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many segments of highways serve both through movement and local access. Many of these highways are the main street of major Montgomery County business districts.

A Successful Regulations Process: We remain concerned that the joint Executive-Council process for revising the standards forwarded in this legislation be conducted through a clearly defined and efficient process that includes retaining qualified consultants to facilitate stakeholder input and draft and finalize technical standards for adoption. We also hope to see a technical advisory committee created to oversee the process and ensure that stakeholders and experts are engaged in the process. We urge the Council to work with the Executive to ensure that the process is not dominated by those in Department of Public Works and Transportation who have demonstrated strong resistance to the intent of this bill. Dominant elements of DPWT have continued to express great skepticism regarding the broad applicability of many of the standards proposed here or defined in the ITE manual for Context Sensitive Solutions for Major Urban Thoroughfares for Walkable Communities (hereafter "ITE manual"). We would be greatly disappointed if this resistance from DPWT were to subvert the efforts of the Council and the County Executive to adopt state of the art practice for road designs and operations which fully recognize the needs of all users. We concur with Dr. Ewing -- too much flexibility will not produce the desired results of a more balanced multi-modal street system.

Resurfacing: We request that the bill include the possibility of bringing roadways up to standard as the result of a resurfacing project. While it will not always be possible to bring the roadway to the new standard, many times compliance with the new standards simply requires restriping narrower travel lanes and other simple changes. To ensure that the opportunity offered through resurfacing is not overlooked, we suggest the following language be added to the bill:

The revised standards shall apply to resurfacing projects where restriping with the new travel lane and bicycle lane dimensions or other changes requires no or minimal additional traffic analysis. If the roadway is resurfaced and the old standard dimensions facilities are put back in place, a written explanation shall be provided to the Planning Board and County Council justifying the action to maintain the old standards.

Regarding the table of values (circle 200 & 201) providing general standards for roadway dimensions and key operational considerations, we suggest the following:

Bicycle Lane Width: The ITE manual recommends wider bicycle lane widths than the 4 and 5 feet recommended here. We recommend adding the wider range as they appear in the ITE manual of 5 and 6 feet. For Business District Streets, we recommend allowing for bicycle lanes and shared lanes where right of way permits and high traffic volumes occur. In particular, we recommend allowing for 4 foot bicycle lanes and encouraging 13 foot shared parking/bicycle lanes which are likely to be the most appropriate on-street accommodation for bicycling in low speed/high volume traffic urban environments. The table shows 3 foot bicycle lanes for Primary and Secondary Residential streets. This is substandard according to ITE and should be changed to 4 feet. However, we note that most low speed/low volume traffic environments do not require specific space in addition to the vehicle travel lane for safe and comfortable bicycling.

Parking Lane Width: We recommend following the ITE guidance on parking lanes and include a column on parking in this table. On-street parking is an important tool for reducing vehicle speeds,

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buffering pedestrians from moving traffic, and providing valuable front-door parking for customers in business districts. On-street parking is also a more efficient resource for both residential and commercial districts because it requires about half the area of off-street parking. The County should actively promote the use of on-street parking wherever possible. Increased on-street parking (especially when well managed) can reduce the need for more costly and less efficient off-street parking. We recommend a Parallel Parking Lane Width column indicating values of 7 – 8 feet, consistent with the ITE manual. The ITE's suggested 13 foot shared parking/bicycle lane should appear here as well.

Curb Return Radii Performance Measures: We agree that specific dimensions are not appropriate in the law. Instead, we suggest establishing performance measures to achieve the outcome desired for streets that are intended to be more pedestrian-oriented. We suggest a performance measure which causes motor vehicles to slow to turning speeds of 10 mph for urban streets to protect and enhance the sense of safety for pedestrians. The values to achieve this performance measure should be defined in the regulations.

Overall Bicycling Policy for County Roadways: We wish to reiterate the need to recognize the obligation to provide for safe bicycling on all County roadways. The bill should be consistent with the Bikeways Master Plan which states, "Current State and County policies require that all new roads and highways be designed to accommodate bicycles and that all road improvement projects to incorporate bicycle elements where feasible."

Thank you for your continued efforts and your consideration of these comments.

Sincerely,



Cheryl Cort
Policy Director

numerous innovations for bicycle facilities on thoroughfares, intersection lane treatments, use of technological advancements at intersections and signing and marking. Some of the innovations to consider include:

- Bicycle boulevards;
- Contra-flow bicycle lanes;
- Unique bicycle lane markings and coloration for visibility and separation;
- Specialized markings and signing for route identification;
- Channelized bicycle lanes at intersections; and
- Innovative bicycle detection and actuation devices.

Recommended Practice

Table 9.2 presents the recommended practice for bicycle facilities on major thoroughfares. The recommendations assume arterial and collector streets in urban contexts with operating speeds of 35 mph or less.

On-Street Parking Configuration and Width

Background and Purpose

The presence and availability of on-street parking serves several critical needs on urban thoroughfares: to meet parking needs of adjacent uses, protect pedestrians from moving traffic and increase activity on the street. Usually, on-street parking cannot by itself

meet all of the parking demand created by adjacent land use and typically will supplement the off-street parking supply. On-street parking provides the following benefits:

- Supports local economic activity of merchants by providing proximate access to local uses, as well as visitor needs in residential areas;
- Increases pedestrian comfort by providing a buffer between pedestrians and moving traffic;
- Slows traffic, making pedestrian crossing safer;
- Enables drivers and their passengers to become pedestrians conveniently and safely;
- Increases pedestrian activity on the street since people will walk between their parking space and destination, providing more exposure to ground floor retail and increasing opportunities for social interactions;
- Increases local economic activity by increasing the visibility of storefronts and signs to motorists parking on street;
- Supports local businesses by reducing development costs for small business by decreasing on-site parking needs;
- Provides space for on-street loading and unloading of trucks, increasing the economic activity of the street and supporting commercial retail uses; and

Related Thoroughfare Design Elements:

- Lane width
- Curb extensions
- Bicycle facilities

Table 9.2 Recommended Practice for Bicycle Lanes on Major Urban Thoroughfares

	Minimum Width	Recommended Width
Bicycle lane width—combined with on-street parking lane		
All thoroughfare types	12 Ft.	13 Ft.
Bicycle lane width—no on-street parking		
All thoroughfare types	5 Ft. [1]	6 Ft.
Table notes:		
[1] Requires a minimum 4-foot width outside of gutter pan. If no gutter pan is present, the minimum width is 4 ft.		

Lighting

If nighttime or twilight time use of the path is expected (i.e., used for commuting), adequate pedestrian-oriented lighting for the path should be provided. Types, locations, intervals and illumination levels can be determined during facility planning. Good lighting is especially needed at intersections. The latest recommendation of the Illuminating Engineering Society of North America (IESNA) should be followed. In addition, all lighting should conform to the County's Lighting policy.

Bike Lanes

Bike lanes provide a designated travel lane adjacent to other travel lanes for the preferential or exclusive use of bicycles. They are one-way facilities that carry bicycle traffic in the same direction as adjacent motor-vehicle traffic. Bike lanes should never be provided on only one side of a two-way street; this may cause confusion and encourage bicyclists to use the bike lanes as a two-way on-street bike path. Motorists are prohibited from using bike lanes for driving or parking, but may use them for emergency avoidance maneuvers or breakdowns.

Bike Lanes - General Design Characteristics

- 4'- 6' marked lane
- Delineated by 6" wide solid white line to separate it from motor vehicle travel lanes
- Identified by pavement markings (bike logo or bike lettering with arrow (see Figures 3-6 and 3-7))
- Designed and constructed to AASHTO and MUTCD standards, including appropriate informational, warning and regulatory signs.

Bike Lanes - Other Design Considerations

Width Standards

The AASHTO recommended minimum width of a bike lane for a closed section road is 1.8 m (5 ft), as measured from the center of stripe to the curb or edge of pavement. This width enables cyclists to ride far enough from the curb to avoid debris and drainage grates, yet far enough from passing vehicles to avoid conflicts. By riding away

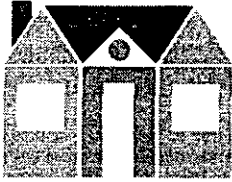
from the curb, cyclists are more visible to motorists than when hugging the curb. The minimum bike lane width is four feet on open shoulders and five feet from the face of a curb, guardrail or parked cars. A clear riding zone of four feet is desirable if there is a longitudinal joint between asphalt pavement and the gutter section. On roadways with flat grades, it may be preferable to integrate the bike lane and gutter to avoid a longitudinal joint in the bike lane.

Bike lanes wider than six feet may be desirable in areas of very high use, on high-speed roads where wider shoulders are warranted, or where they are shared with pedestrians. Care should be taken so they are not mistaken for a motor vehicle lane or parking area, with adequate marking or signing.

Pavement Markings and Signs

A bike lane should be marked with pavement stencils and a wide stripe. If parking is permitted, the bike lane should be placed between the parking lane and the travel lane, and have a minimum width of 1.5 m (5 ft). The official pavement stencil for all future or renovated bike lanes should be a bike logo or "bike lane" lettering and an arrow pointing bicyclists in the direction of traffic.

- Motorists should be alerted to presence of a bike lane using appropriate MUTCD-approved signs ("Bike Lane Ahead") at least 50 feet prior to the beginning of a bike lane, unless at an intersection where it should be placed within 25 feet of the intersection.
- Appropriate MUTCD-approved signs (Bike Lane Ends) should be placed where a bike lane suddenly terminates, whether at an intersection or middle of a road segment.
- Appropriate MUTCD-approved signs (Bicycle Right Lane Only) should be placed every 500 feet on both sides of the road.
- Appropriate MUTCD-approved signs (No Parking, Bike Lane) should be placed every 200 feet on both sides of the road to discourage illegal use of a bike lane by motorists.



GARRETT PARK ESTATES - WHITE FLINT PARK CITIZENS' ASSOCIATION

March 28, 2007

The Honorable Marilyn Praisner, President
Montgomery County Council
100 Maryland Avenue
Rockville, Md. 20850

Re: Bill 48-06 Streets and Roads
SRA 06-04, Streets and Roads – Design Standards

Dear Council President Praisner:

Garrett Park Estates – White Flint Park Citizens' Association is concerned with the possible impact that changes in the road code could have on our community. We recognize the importance of pedestrian safety and urge the establishment and enforcement of safe crossing opportunities for pedestrians. We have two major concerns with some of the material we have read relating to the road code:

1. MD 355/ Wisconsin Ave/Rockville Pike is a major transportation corridor and needs to be recognized as such by whatever classification it is given. Maintaining a reasonable traffic flow throughout the corridor is critical. Breaking this arterial into segments with different roadway classifications will detract from recognition of the importance of the corridor as a whole and fail to recognize that what happens on one part of Rockville Pike effects the other parts.
2. The Grosvenor Metro Station Policy Area is a residential community, as planned in the North Bethesda/ Garrett Park Master Plan and needs to be treated as such. We believe that business district standards relating to commercial development should not arbitrarily be applied to all Metro Station Policy areas, but rather should be applied only where sufficient commercial development requires a different design.

We are concerned that major highways in this County are State owned and not subject to the County road code. We question the effect of this legislation on these corridors.

Thank you for considering our concerns.

Sincerely,

Jay Hansen
President

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Officers

Jay Hansen - President ■ Joan Kornblith - Vice President
Jane Huff - Secretary ■ Thomas Becker - Treasurer

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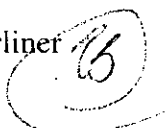
MONTGOMERY COUNTY COUNCIL
ROCKVILLE, MARYLAND

ROGER BERLINER
COUNCILMEMBER
DISTRICT 1

MEMORANDUM

April 18, 2007

TO: Councilmember Nancy Floreen, Chair
Transportation and Environment Committee

FROM: Councilmember Roger Berliner 

SUBJECT: Bill 48-06

I commend you and your colleagues for your hard work on a comprehensive re-write of our Road Code. It is long overdue, and I thank you for your leadership on this initiative.

One aspect of our Road Code that is particularly out of date relates to construction practices in our urban centers. In my discussions with Chairman Hansen and our staff, I found consensus that current practices are more appropriate for suburban communities than for areas like Bethesda. The County needs to provide safe passage for pedestrians in urban areas even during construction. Road and lane closures should be minimized. Interminable sidewalk and street closures create strong community resentment that undermines smart growth.

Your bill, as introduced, recognizes different standards for different areas of the County. The degree of urbanization governs roadway and pedestrian improvements. The level of urbanization also guides the bill's approach to obstructions in the public right-of-way. The extent and duration of such interference is different in urbanized areas than it is in more suburban development; however, if the street is closed, or other more subjective conditions exist, a permit to obstruct the right of way may still be issued under the current bill.

I am concerned that Bill 48-06 may not go far enough in protecting the public right-of-way. I want to adopt more limitations on temporary lane and sidewalk closures. My thoughts, however, are not yet sufficiently refined to provide specific additions and deletions from the bill before you. If the Committee is still working on the Road Code in June, I would like to take the opportunity to present specific changes to the Committee. If the Road Code has reached the Council in June, I will bring these changes to the Council worksession on the bill.

I look forward to working with you and your colleagues on this matter.

Copies: Councilmember Valerie Ervin
Councilmember George Leventhal

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